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(54) Closure for drinking container

(57) The invention relates to a closure (20) for a fluid dispenser (10) comprising a cap (40) with

attachment means (80) for attaching the cap (40) to the fluid dispenser (80),
dispensing means (30) for dispensing a liquid from the fluid dispenser (10), and
ventilating means (120) for ventilating the fluid dispenser (10), said ventilating means (120) containing a liquid-impermeable but gas-permeable functional layer (140), and
sealing means (60) for sealing the dispensing means (30) and the ventilating means (120) from atmosphere, wherein said sealing means (60) is adapted to swivel around an axis (70) through the closure (20) such that in a first position the ventilating means (120) and the dispensing means (30) are sealed, in a second position the dispensing means (30) is sealed but the ventilating means (120) is open to atmosphere and in a third position the dispensing means (30) and the ventilating means (120) are open to atmosphere. Preferably the functional layer (140) is made of expanded PTFE.

The fluid dispenser (10) is particularly suitable as a drinking bottle for cyclists.

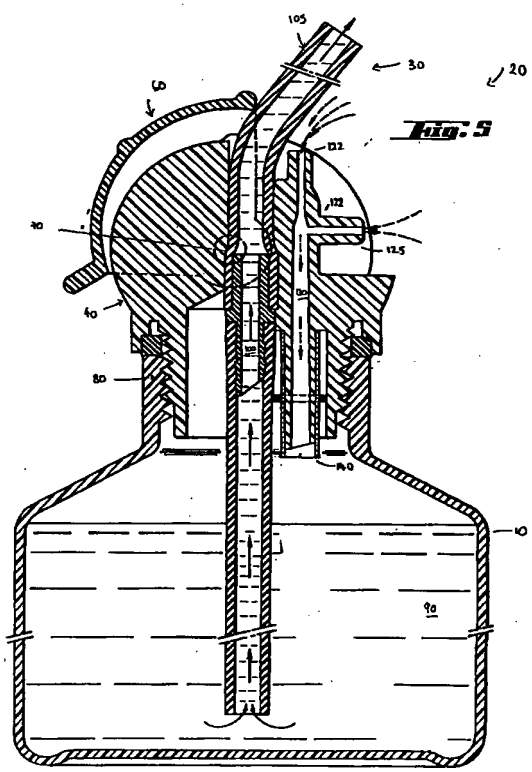

Fig. 5

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Description

The invention relates to a closure for a fluid dispenser comprising a cap with attachment means for attaching the cap to the fluid dispenser, dispensing means for dispensing the liquid from the fluid dispenser, and ventilating means for ventilating the fluid dispenser, said ventilating means containing a liquid-impermeable but gas-permeable functional layer, and sealing means for sealing the dispensing means and the ventilating means from atmosphere.

The use of ventilating means to ventilate the contents of a fluid dispenser is known in the prior art, for example, from US-A-5 074 440, US-A-4 533 068, US-A-3 655 102, and US-A-3 952 902. Such ventilating means are used to ensure that air - or other gases - are able to enter the interior of the fluid dispenser in order to equalise the pressure within the dispenser with that of the outside atmospheric pressure. A functional layer which is liquid impermeable but gas permeable is often incorporated into these devices to ensure that no liquid is able to escape from the interior of the bottle but that gas is allowed to pass through the ventilating means.

It is also known to use a membrane such as an expanded PTFE membrane as a functional layer. Such membranes are available from W.L.Gore & Associates and are sold under the trade mark GORETEX®. These membranes have the advantage that they furthermore do not allow dust or other dirt particles to enter the interior of the fluid dispenser and thus contaminate the contents of the fluid dispenser.

One disadvantage with fluid dispensers with conventional ventilating means is that the ventilating means are continually open to the atmosphere. Thus if the liquid within the fluid dispenser is extremely volatile it will eventually completely evaporate out of the bottle into the atmosphere. A similar problem occurs if the fluid dispenser contains carbonated ("fizzy") water. As is well known, after a period of time, if a beaker of carbonated water is left standing in air, all of the carbon dioxide will be eventually expelled from the water and the water will become "flat". This problem is particularly aggravated when the beaker - or the fluid dispenser - is agitated. The carbon dioxide gas escapes from the water far more quickly than if the water is left standing still. This is a problem in particular for cyclists who often have a water dispenser attached to their bicycles and who wish to carry carbonated water or other drinks in the water dispenser.

One solution to this problem is known from the German Patent DE-C-43 22 522 (Plachky) assigned to Honasco Kunststofftechnik GmbH & Co. KG. This patent document describes two embodiments of such a closure for a water bottle. In the first embodiment, depicted in Fig. 1 of the said patent, the cap is opened to expose the ventilating means and the dispensing means to the air at the same time. Experiments have shown, however, that this first arrangement is unsatisfactory as carbon dioxide continually escapes into the space beneath the cap and thence through the seal between the cap and the closure into the atmosphere. After around half an hour, little or no carbon dioxide is left in the water in the bottle. Furthermore, it has been found that if the cap is opened before all the gas is expelled from the water, the ventilating means is not adequate to ventilate the interior of the bottle in the short period of time between opening of the ventilating means and opening of the dispensing means (i.e. the drinking opening). Thus, there is a tendency for the liquid to "froth up" through the drinking opening. This is particular unpleasant for the cyclists if the fluid within the bottle is a sweetened drink such as FANTA® or COCA-COLA® because after the sweetened drink dries on the cyclist's clothes it forms a sticky mass which is unattractive and attracts dirt.

Another embodiment is described in Fig. 3 of the DE-C-43 22 522 patent. Whilst this construction provides a better ventilating means, it is more difficult to manage for a cyclist on the move. In particular, it is necessary to push down an element in order to ventilate the interior of the bottle prior to drinking from the bottle. The element is incorporated into the drinking opening of the closure and thus impedes the easy drinking of the fluid from the bottle. Furthermore, when the bottle contains a sweetened carbonated drink, this drink will coat the element and, after drying, act as a dirt trap.

It is therefore an object of the invention to provide a closure for a fluid dispenser which overcomes these problems.

It is furthermore an object of the invention to provide a closure for a fluid dispenser which reliably ventilates the contents of the fluid dispenser.

It is furthermore an object of the invention to provide a closure for a fluid dispenser which reduces the risk of spillages of the fluid.

It is furthermore an object of the invention to provide a closure for a fluid dispenser which is easy to operate.

It is furthermore an object of the invention to provide a closure which is not susceptible to dirt traps.

These and other objects of the invention are solved by providing sealing means adapted to swivel around an axis through the closure such that in a first position the ventilating means and the dispensing means are sealed, in a second position the dispensing means is sealed but the ventilating means is open to atmosphere and in a third position the dispensing means and the ventilating means are open to atmosphere.

The inventive swivelled sealing means allows for easy operation of the closure. The period of time that elapses between swivelling the sealing means from the second position to the third position allows ample time for the contents of the fluid dispenser to be adequately ventilated. Thus the fluid from within the interior of the fluid dispenser cannot froth up and spill onto the outside of the fluid dispenser.

In a further embodiment of the invention, the dispensing means comprises a drinking tube extending through the cap, one end of which is immersed in the liquid and the other end of which is adapted for insertion into a mouth. The provision of the drinking tube ensures that the person drinking the fluid can insert the tube into his or her mouth and ensure that spillages of the fluid are kept to a minimum and hence dirt traps are prevented. Furthermore, the provision of the drinking tube obviates the need for tilting the bottle in order to drink the liquid contained within the bottle. This is particularly advantageous when sweetened carbonated drinks are being drunk by a cyclist or other sportsperson on the move.

Drinking tubes, as such, as known from US-A-4 095 812. However, the provision of a ventilating means in addition to a dispensing means is not taught in this patent.

In a further embodiment the ventilating means is provided a functional layer which is preferably a membrane and more preferably made from expanded polytetrafluoroethylene (PTFE). Such a functional layer has the advantage that it reliably does not allow liquid to escape from the interior of the fluid dispenser but allows the fluid dispenser to be ventilated. It acts as a trap to ensure that dust particles do not enter the interior of the fluid dispenser. Expanded PTFE is preferred because it is extremely long-lasting and chemically inert.

The sealing means preferably comprises a member protruding from the cap and being adapted to seal the dispensing means when the sealing means is in the first and second positions. This is a particularly simple form of construction for the sealing means which is easy to manufacturer and very reliable. Similarly, in order to provide for simple manufacture, the drinking tube is adapted to seal the ventilating means when the sealing means is in the first position.

The closure described herewith finds application as a drinking bottle, in particular for cyclists. It can furthermore be used as a fluid dispenser for pharmaceuticals, cosmetics or in other applications in which a volatile liquid is used or in which a gas can escape from a liquid within the fluid dispenser.

Fig. 1 shows a front view of a bottle with closure.
Fig. 2 shows a side view from direction II of the same bottle with closure.
Fig. 3 shows a cross sectional view along III-V of the closure of the bottle with the closure in a first completely closed position.
Fig. 4 shows a cross sectional view along III-V of the closure of the bottle with the closure in a second partially closed position.
Fig. 5 shows a cross sectional view along III-V of the closure of the bottle with the closure in a third completely open position.

In the Figures as illustrated the same reference signs are using consistently throughout in order to describe the same elements.

Fig. 1 shows a bottle 10 with a closure 20 including a dispensing means 30 according to the invention. The bottle 10 contains fluids such as drinking water, pharmaceuticals, or cosmetics. In one embodiment of the invention, the bottle 10 contains carbonated water which may be flavoured and which is drunk by cyclists or other sportspeople. The bottle 10 can be made of plastic, aluminium or glass. It may have an inner bottle (not shown) with a vacuum layer between the outer bottle and inner bottle which is designed to keep the liquid in the bottle 10 hot or cold. The closure 20 can be made of plastic or a metal such as aluminium.

Fig. 2 shows a side view from direction II marked on Fig. 1 of the bottle according to the invention. In this figure, the structure of the closure 20 can be seen in more detail. The closure consists of a cap 40 which is inserted into the neck 50 of the bottle 10, the dispensing means 30 and a closing element 60. In the illustrated embodiment, the closing element 60 swivels around an axis 70 through the closure 20.

Figs. 3 to 5 show a cross-sectional view of the bottle 10 and closure 20 through the line III-V marked on Fig. 1. The structure of the closure 20 can be seen in more detail in this figure. The cap 40 is inserted into the neck 50 of the bottle 10 by means of a screw thread 80 which screws into a matching screw thread on the inner side of the neck 50 of the bottle in the illustrated embodiment of the invention. The diameter of the neck 50 may vary from being very small to being almost that of the inside diameter of the bottle 10. Other means of attaching the cap 40 to the bottle may be used. For example, the cap could be made of sealing rubber which is pushed into the neck 50 of the bottle 10 and remains in place due to frictional forces between the rubber and the neck.

The dispensing means 30 is connected to the interior of the bottle 10 and fluid 90 within the bottle 10 by means of a dispensing tube 100 which passes through the cap 40. In the preferred embodiment of the invention the dispensing tube 100 is provided with a flexible tube 105 extending beyond the cap 40 and has its distal end 110 near to the floor of the bottle 10.

The closure 20 has furthermore ventilating means 120. The ventilating means 120 comprises a ventilating pathway 130 integrally moulded through the cap 40. In the depicted embodiment, the ventilating means 120 has two outlets 122 and 125 in the cap. However, it would be possible to provide the ventilating means 120 with a single outlet 125 without departing from its function. The first outlet 122 is constructed as a projection from the cap 40 to form a member 135 whose function will be explained later. The ventilating pathway 130 is completely covered at its distal end by means of a functional layer 140.

The functional layer 140 is made from material which is impermeable to the fluid 90 within the bottle 10 but permeable to gases present in the space 150 above

the fluid 90 in the bottle 10. Its purpose is to allow pressure equalisation of the gas within the space 150 with that of the atmosphere outside of the bottle 10. The functional layer 140 is preferably made of a microporous membrane in disk form or tube shape and is more preferably made of expanded PTFE such as that known from GB-A-1 355 373 assigned to W.L.Gore & Associates and DE-C-29 25 318 (Gore/Allen) also assigned to W.L.Gore & Associates. Other membranes such a polyurethane or polyester may be used as long as they fulfil the requirements of being liquid impermeable but gas permeable. Similarly, woven, non-woven or felt-like textile layers such as cotton treated with chemicals, for example to make them hydrophobic, can also fulfil these requirements. The functional layer 140 is chosen such that it is impermeable to the fluid 90 contained within the bottle 10, i.e. it cannot be wetted by the fluid 90. The pore size and the surface area of the functional layer 140 must be chosen such that sufficient gas can pass through the functional layer 140 within a relatively short period of time available for the ventilation of the interior of the bottle 10 as will be explained below. In order to increase the surface area of the functional layer 140, the functional layer 140 can be constructed in the form of a tube. The functional layer 140 is attached to the ventilating pathway 130 by means of an adhesive, welding or other means.

The operation of the invention will now be described using the Figs. 3 to 5. Fig. 3 shows the closing element 50 in a first position. In this first position both the ventilating means 120 and the dispenser 30 are isolated from the atmosphere outside the bottle 10. In the illustrated embodiment of Fig. 3 this is achieved by providing the dispenser 30 with the flexible tube 105. The flexible tube 105 is bent over the member 135 by the closing element 60 and is "pinched" between the inner surface of the closing element 60 and member 135. In the depicted embodiment, the member 135 incorporates the ventilating pathway 120 and first outlet 122. However, it could also be constructed as a solid body without the first outlet 122. As a result the flexible tube 105 is completely closed and no liquid or gas can escape from the inside of the bottle 10 through the dispensing tube 100 and flexible tube 105 to the outside atmosphere. Other means for sealing the dispenser 30 from the outside atmosphere could include providing a separate bung on the inside of the closing element 60 which when the closing element 60 was in the first position would fit into the inner diameter of the dispensing tube 100. Alternatively, a flap could be provided to the left of the end of the dispensing tube 100 which, when the closing element was in the first position, would be pushed over the end of the dispensing tube 100 so as to seal the dispenser 30 from the outside atmosphere. Other sealing arrangements are known to the skilled man.

The ventilating means 120 are sealed in the depicted embodiment by ensuring that the flexible tube 105 is sufficiently long that it can be pushed over the outlets 122 and 125 of the ventilating means 120. In the depicted embodiment the ventilating means 120 is provided with two outlets 122 and 125 and the flexible tube has to be sufficiently long in order to seal both of these outlets. When the closing element 60 is in the depicted first position, the flexible tube 105 is pushed across the full diameter of the outlets 122 and 125 and the flexible tube is sufficiently compressible to ensure a gas-tight fit to isolate the interior of the bottle 10 from the atmosphere outside the bottle 10. Other methods of sealing the ventilating means 120 are known. For example, the closing element 60 could be provided with a bung which when the closing element 60 was in the depicted first position would fit into the inner diameters of the tubes at the outlets 122 and 125. Alternatively, flaps could be provided to the left of the outlets 122 and 125 which would cover the openings of the outlets when the closing element 60 was in the aforementioned first position.

As mentioned above, in the first position depicted in Fig. 3, both the ventilating means 120 and the dispenser 30 are provided with liquid-tight and gas-tight fittings which ensure that no liquid or gas can escape from the interior of the bottle 10 to atmosphere. Thus pressure can build up within the bottle 10 as shown by the arrows labelled P in the space 150. There is no possibility to equalise this pressure with the atmospheric pressure when the closing element 60 is in this first position.

Fig. 4 shows the closing element 60 in a second position. In this position, the dispenser 30 is still sealed from the atmosphere by the closing element 60 pushing the flexible tube 105 against the member 135. However, the ventilating means 120 at outlet 125 is now open and gas can escape from the interior of the bottle 10 through the ventilating tube 130. Due to the presence of the liquid-impermeable functional layer 140, however, the liquid in the bottle 10 cannot escape. In this second position, pressure equalisation of the interior of the bottle 10 with the atmosphere can be achieved as is shown by the arrows in the Fig. 4.

Finally Fig. 5 shows a third position in which the dispenser 30 is no longer isolated from the atmosphere. This allows liquid to be dispensed through the flexible tube 105 through the dispensing tube 100 from the interior of the bottle 10 as is shown by the arrows in the figure. The ventilating means 120 now allows air to enter into the interior of the bottle 10 as shown in order to compensate for the liquid being removed. In this third position, the functional layer 140 acts as a filter to ensure that dust or other dirt particles do not enter into the interior of the bottle 10.

The bottle 10 with closure 20 can be used as a drinking bottle. In this case the flexible tube is so designed that it can be inserted into a person's mouth. Particularly advantageous is this arrangement when the bottle 10 is being used by a cyclist on the move. The provision of the flexible tube 105 as a "drinking straw" allows him to drink from the bottle whilst cycling and

ensuring that he or she does not spill the fluid. The pressure equalisation step carried out when the bottle is in the second position (Fig. 4) ensures that the liquid contents of the bottle 10 do not "froth up" when the bottle 10 is opened.

The bottle 10 can also find application in storing pharmaceutical solutions or cosmetic solutions which are extremely volatile.

Claims

1. Closure (20) for a fluid dispenser (10) comprising a cap (40) with

   attachment means (80) for attaching the cap (40) to the fluid dispenser (80),
   dispensing means (30) for dispensing a liquid from the fluid dispenser (10), and
   ventilating means (120) for ventilating the fluid dispenser (10), said ventilating means (120) containing a liquid-impermeable but gas-permeable functional layer (140), and
   sealing means (60) for sealing the dispensing means (30) and the ventilating means (120) from atmosphere,
   wherein said sealing means (60) is adapted to swivel around an axis (70) through the closure (20) such that in a first position the ventilating means (120) and the dispensing means (30) are sealed, in a second position the dispensing means (30) is sealed but the ventilating means (120) is open to atmosphere and in a third position the dispensing means (30) and the ventilating means (120) are open to atmosphere.

2. Closure (20) according to claim 1 wherein
   the dispensing means (30) comprises a drinking tube (105) extending through the cap (40), one end of which is immersed in the liquid (90) and the other end of which is adapted for insertion into a mouth.

3. Closure (20) according to claim 2 wherein
   said drinking tube (105) is flexible

4. Closure (20) according to claim 1 wherein
   said ventilating means (120) comprises an opening through the cap (40), the inner diameter of said opening being completely enclosed by the functional layer (140).

5. Closure (20) according to claim 1 or 4 wherein
   the functional layer (140) is a membrane.

6. Closure (20) according to claim 5 wherein
   the functional layer (140) is made from expanded polytetrafluoroethylene.

7. Closure (20) according to claim 1 wherein
   the sealing means (60) further comprises a member (135) protruding from the cap (40) and being adapted to seal the dispensing means (30) when the sealing means (60) is in the first and second positions.

8. Closure (20) according to claim 3 wherein
   the drinking tube (105) is adapted to seal the ventilating means (120) when the sealing means (60) is in the first position.

9. Drinking bottle with closure (20) according to one of the above claims.

Fig. 1

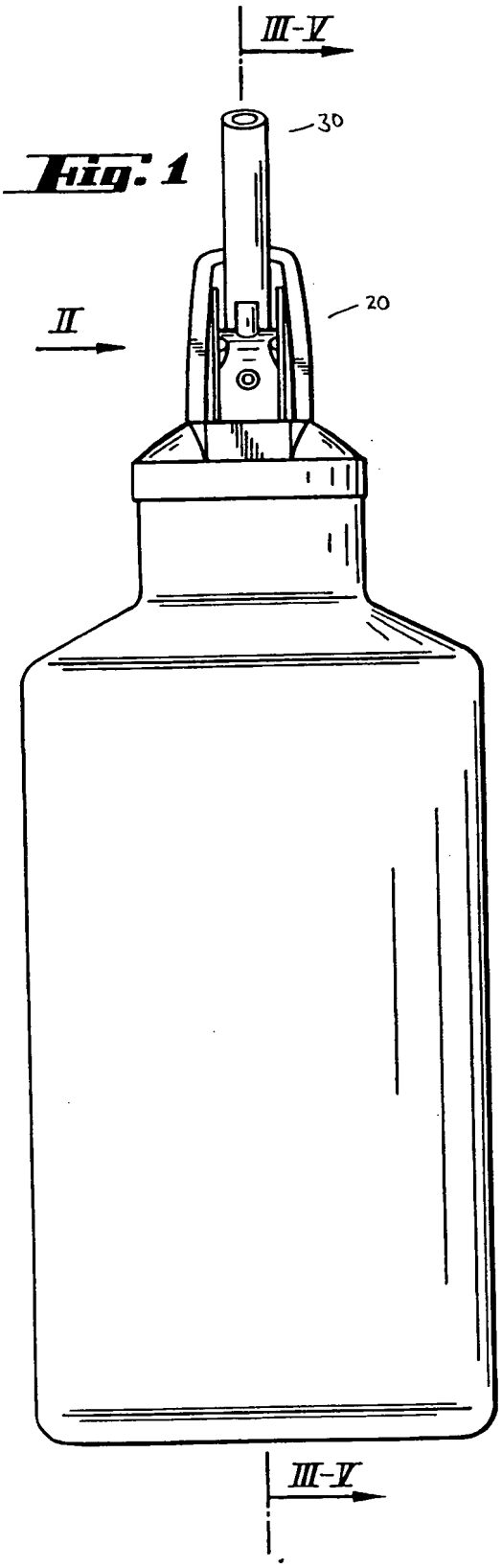
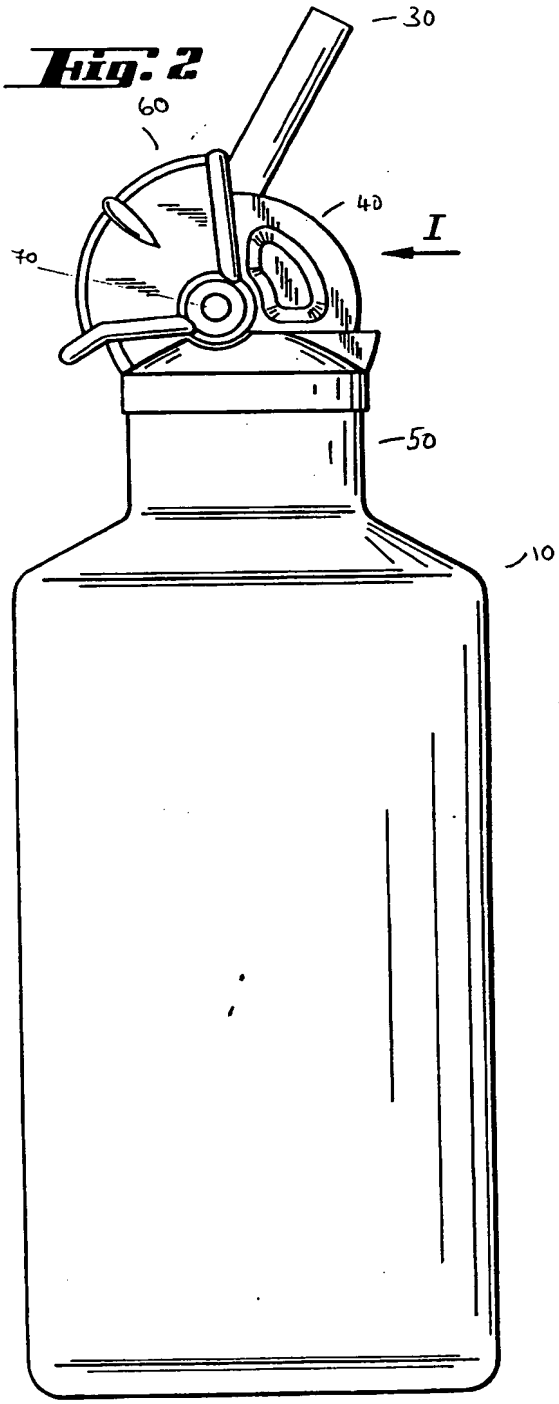


Fig. 2



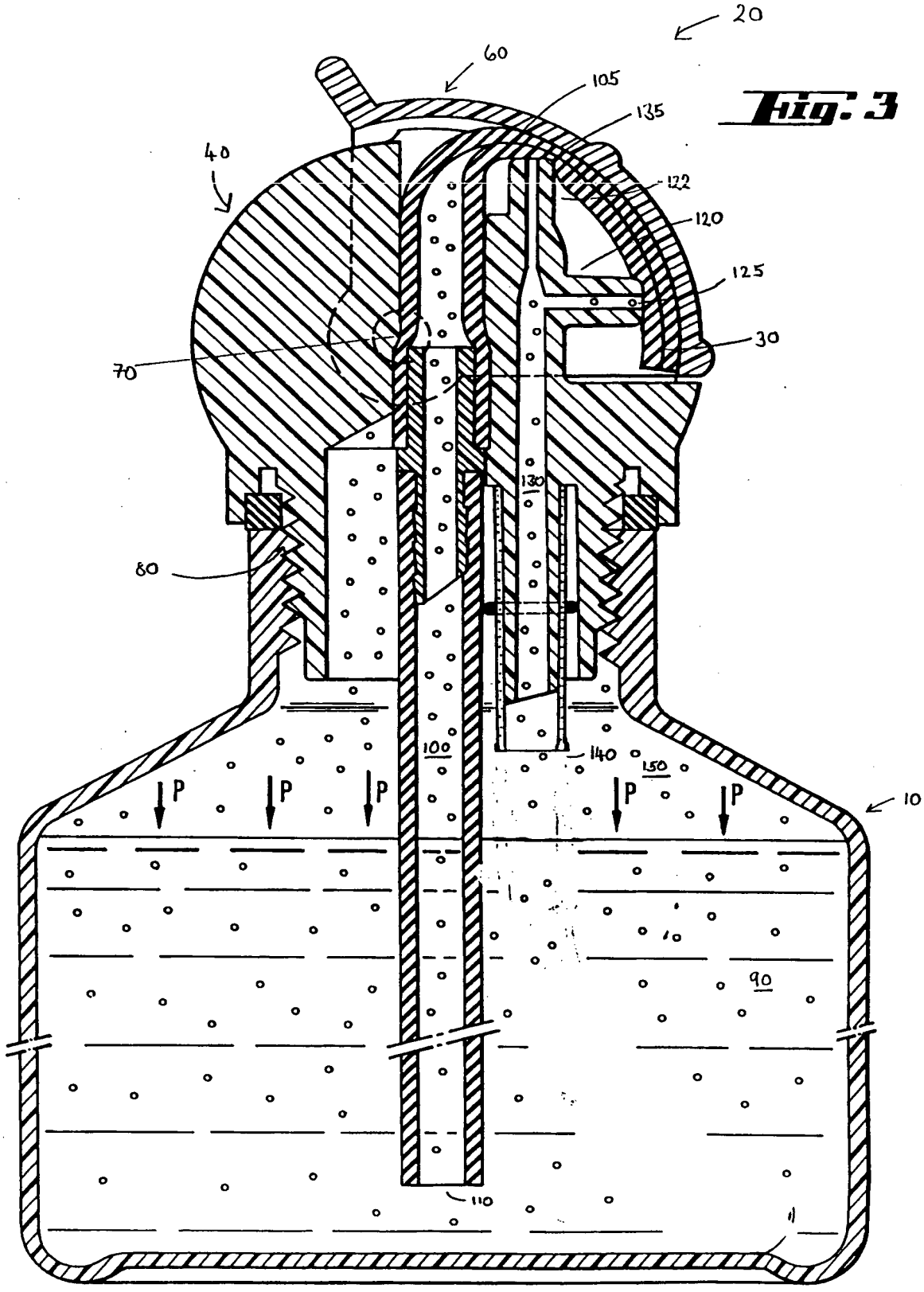


Fig. 3

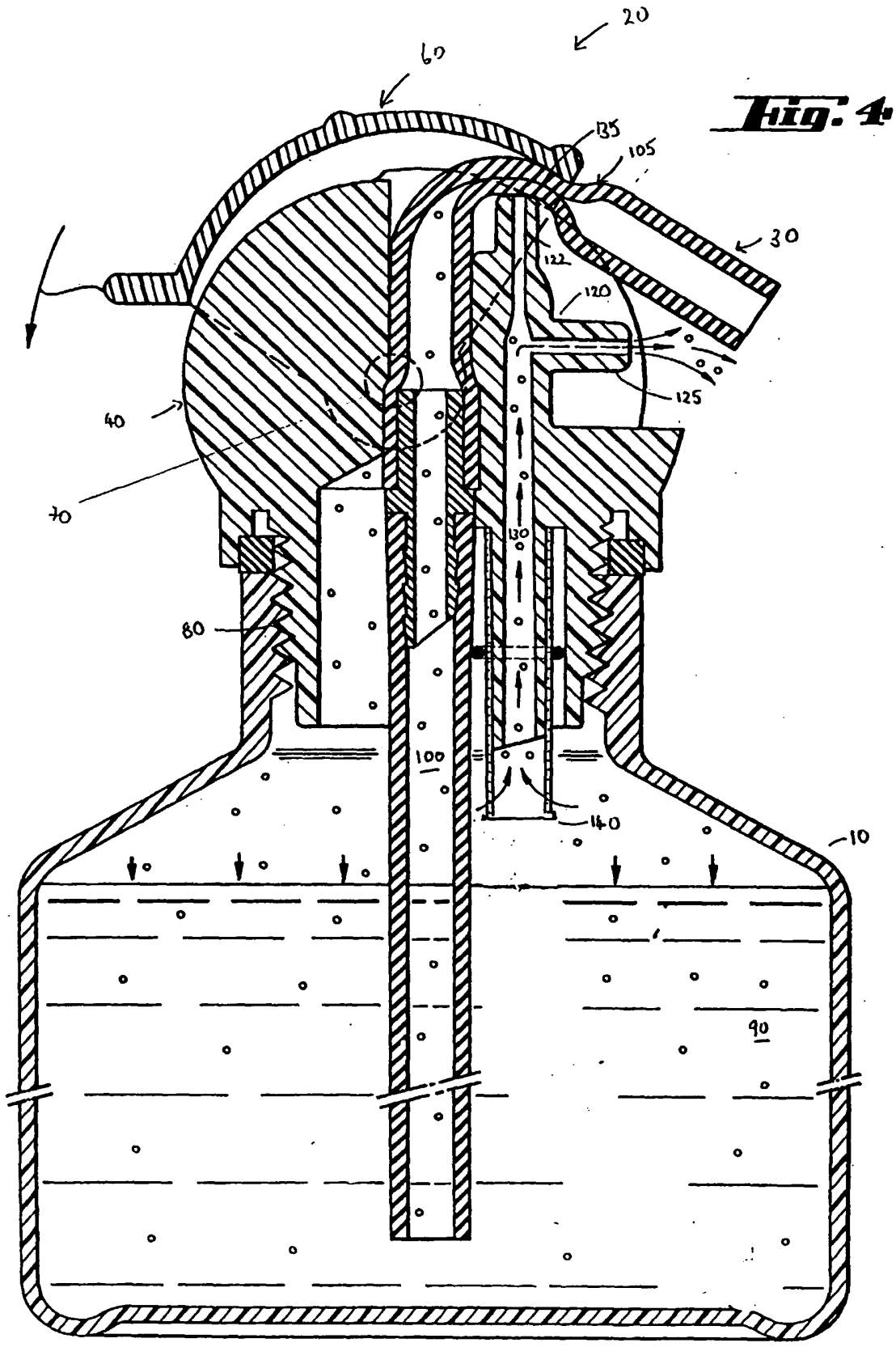


Fig. 4

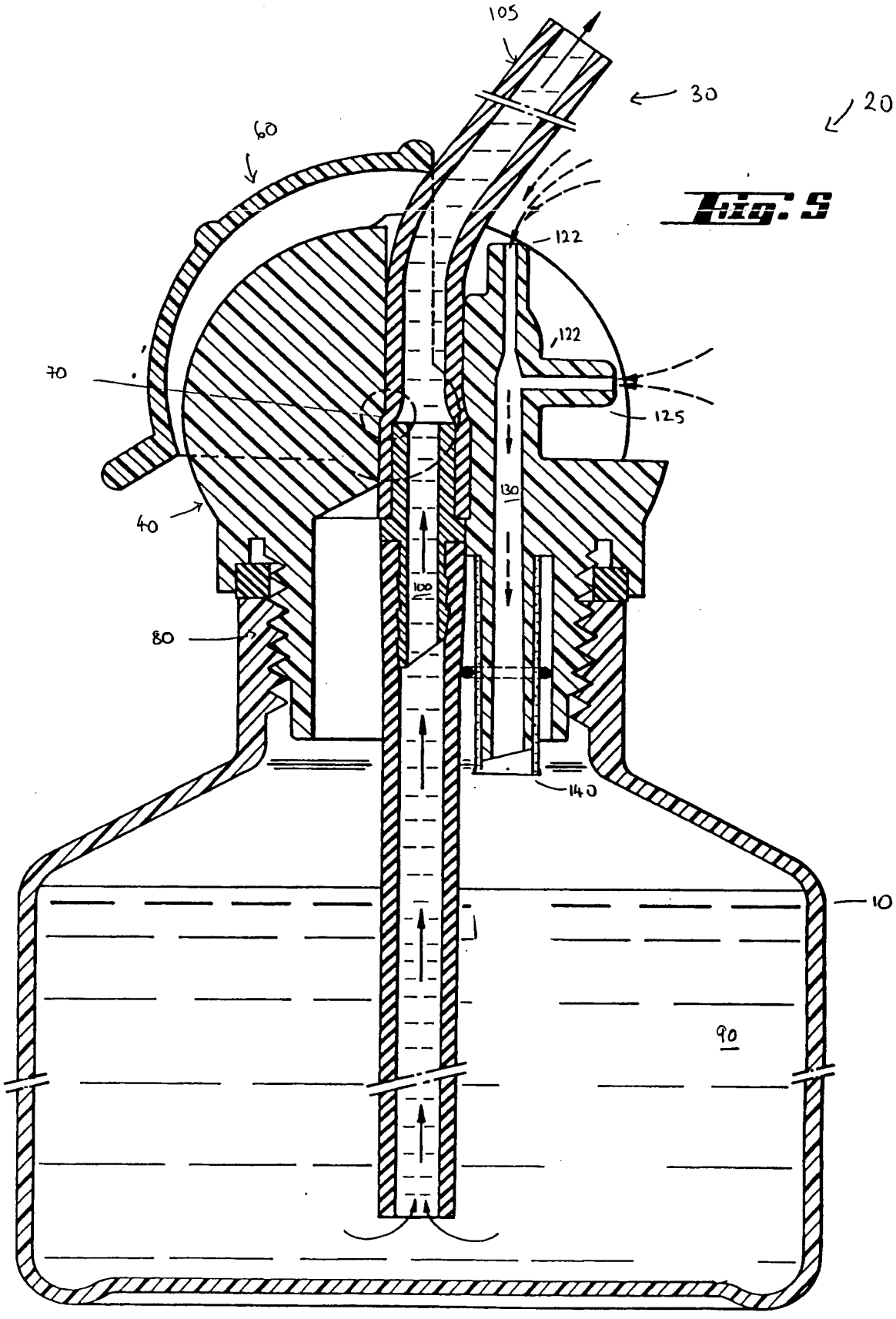


Fig. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 11 3543

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US-A-5 259 538 (TARDIF) * column 2, line 59 - column 3, line 54; figures 1-7 *	1,9	B65D47/20 B65D47/06
A	US-A-5 337 918 (WANG) * column 3, line 51 - column 4, line 6; figures 1,2,5 *	1,9	
A,D	US-A-5 074 440 (CLEMENTS) * column 8, line 47 - column 9, line 8; figures 16-18 *	1	

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TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17 January 1997	Newell, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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